A Quantitative Approach to Optimizing Sustainable Development

CTG's Sustainable Communities Model™

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Trends in Sustainable Planning:

- *Current activity is primarily Top-Down*
  - Planning & regulatory driven
  - Minimal private-sector input
- Growing understanding of complex interrelations
  - e.g., Energy ⇆ Water ⇆ Air Pollution linkages
    (PIER Research Report CEC-500-2005-031)
  - Climate Change
  - Air Pollution
  - Water
  - Stormwater, etc.
- Increasing focus on *quantitative* tools
  - PLACES^3
  - CA Climate Action Registry,
  - URBEMIS, etc.
  - Title 24 energy standards

CTG vision

Rubber Hits the Road With...

Critical Sustainability Decision-Makers

- Developers
  - Design & build the infrastructure
  - Develop design guidelines
  - Very influential on community “sustainability”
- Builders
  - What is actually built:
    - building efficiency, water efficiency, landscaping, etc.
  - Respond to customer demand...
- Homebuyers & Tenants
  - Ultimately **PAY** any “Green Premium”
  - Need to understand the value, savings & rationale

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Private Sector Challenges

- High construction & housing costs
  - Competition with other upgrades (e.g. granite counter tops)
- Slowing housing market
- Bewildering array of competing & confusing “Green” programs
  - ~ 50 national, state, local & trade residential green building guidelines, rating programs, etc.
- Daunting number of “sustainability” decisions & tradeoffs
- Limited money to implement
- Consumer education & buy-in

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Private Sector ~~Challenges~~ Opportunities

- High construction & housing costs
  - utility savings, improved cashflow, energy efficient mortgages,
- Slowing housing market
  - sustainable developments = competitive advantage
- Bewildering array of competing & confusing “Green” programs
  - Need a project-specific analysis of what makes sense…
- Daunting number of “sustainability” decisions & tradeoffs
  - Quantify benefits, utility savings, and environmental impacts
- Limited money to implement
  - Optimize “Bang for the Buck”
- Consumer education & buy-in
  - Translate vague undefined “green” to real dollars saved, tons of air pollution reduced, gallons of stormwater reduced, etc.

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CTG's "Sustainable Communities Model" (SCM)

- Grew out of market demand
- Developed to:
  - Quantify the actual environmental impacts & linkages of various development decisions
  - Analyze environmental & economic costs, savings, synergies & trade-offs
  - Optimize the sustainability:cost ratio
- Being applied to private sector community development & redevelopment

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Model Structure

Physical Structures

Homes

Public facilities

Commercial buildings

Open space

Roads

Resource Systems

Transportation Systems

Stormwater Systems

Energy Systems

Water Systems

Solid Waste Systems

Pollution & Outputs

- *Air Pollution (on & off-site)*
- *CO_2*
- *Wastewater*
- *Stormwater & Water Pollution*
- *Landfilled Waste*

Upstream linkages

- *Energy-Water-Air pollution-GHGs*
- *etc.*

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Example Project: RMV

- **Rancho Mission Viejo "Ranch Plan"**
  - Large mixed use development in Orange County
    - 14,000 DU's
    - shopping plazas, restaurants, business parks, and civic facilities
    - multimodal transportation system

- **Rancho Mission Viejo's Goals:**
  - **Regional, comprehensive planning versus piecemeal planning**:

    "...regional, comprehensive master plan for Rancho Mission Viejo that will be developed in phases over the next 20 to 25 years. This comprehensive approach to land use planning prevents piecemeal planning that brings few benefits to existing residents."

  - **Recycle & Reduce Impacts through Innovation**:

    "... embrace a broad array of green-building principles to further sustainability and smart growth practices... help reduce traffic flows along Ortega Highway during peak commute times...."

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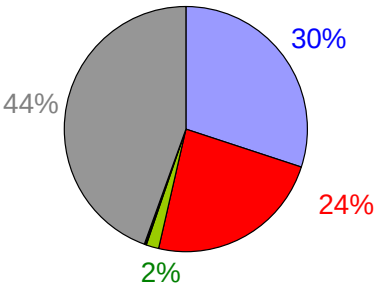
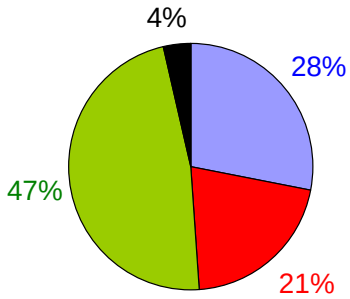
Resource Use Analysis: Targeting Conservation Efforts

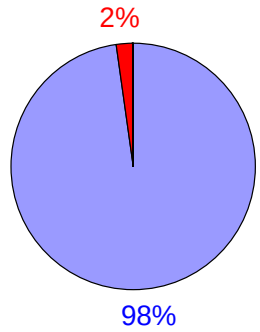
Energy Use



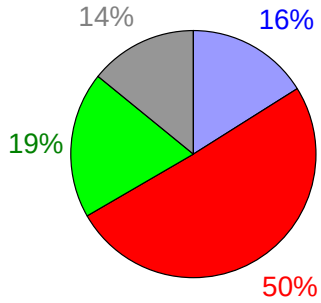
Water Use



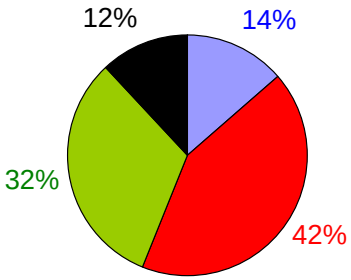
Solid Waste Generation



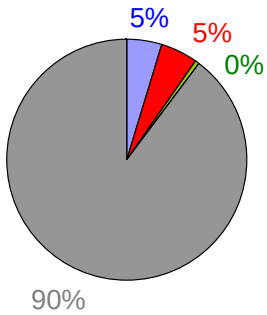
Stormwater Generation



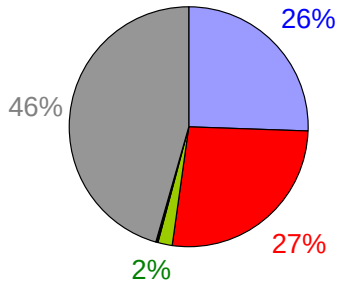
Water Polution



Air Pollution



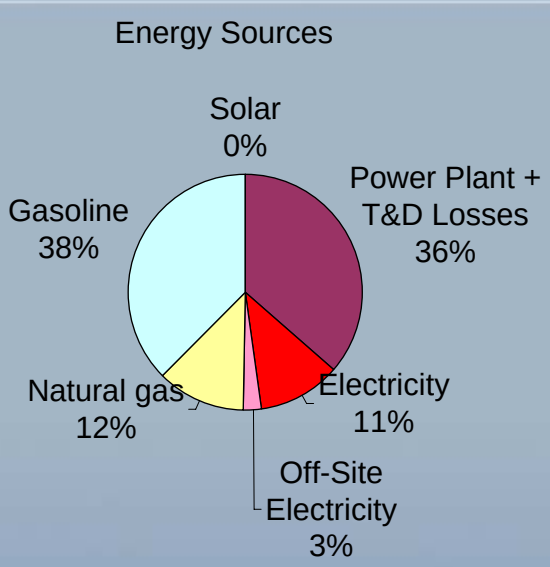
Greenhouse Gas Emissions

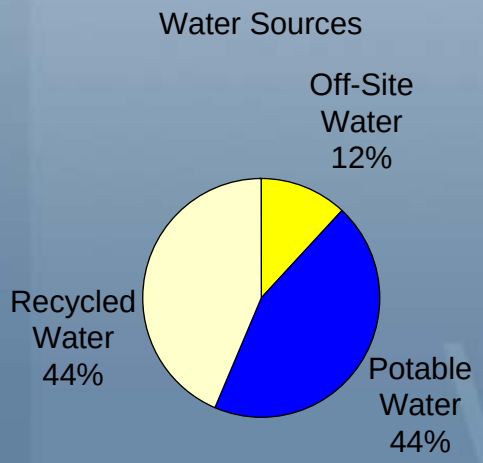


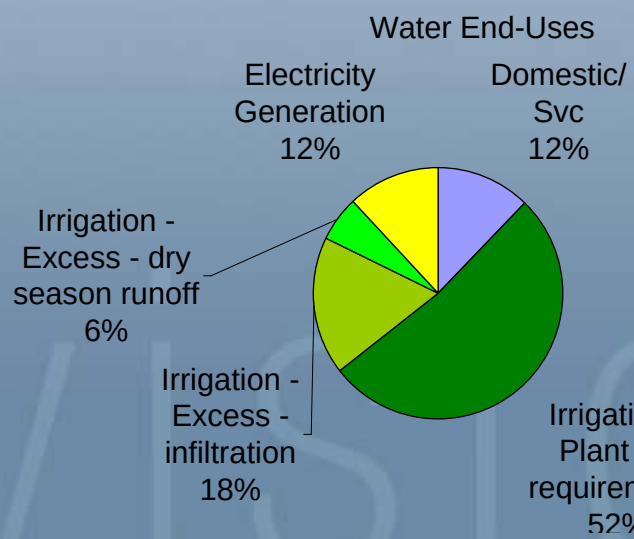
Legend

- Residential
- Commercial/Public/Institutional
- Parks & Open Space
- Roads
- Transportation

Analysis of Sources & Uses







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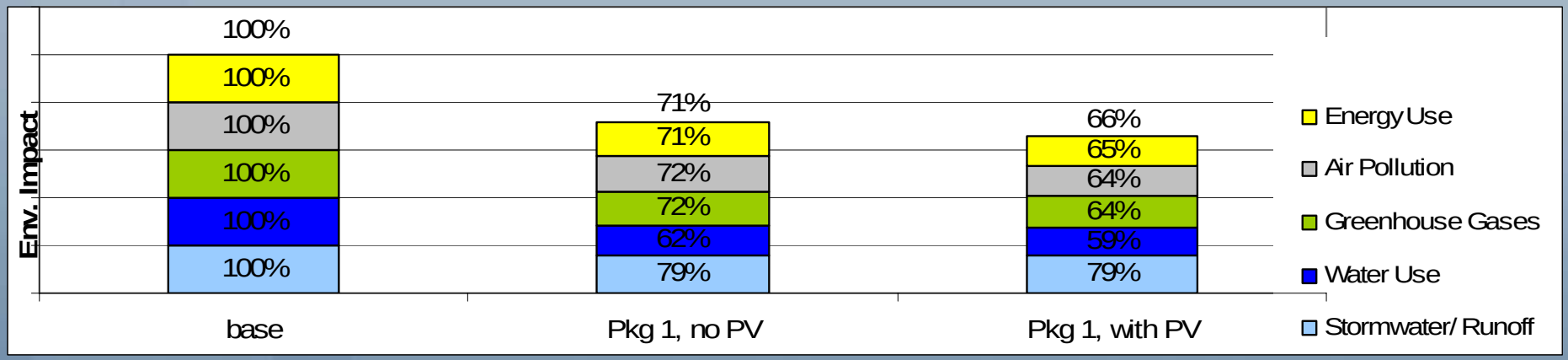
Design Guidelines: Optimized DU Performance

Base case vs. Optimized Environmental Performance (Residential DU)



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Integrated Sustainability Financial Decision Matrix™

Land Developer

Homebuilder

Homeowner

- Environmental Benefits
- Cost Indicators
  - Incremental implementation costs
  - Rebates & incentives
  - Cost recapture & adjustments
  - Net Cost (community and DU level)
  - Annual utility savings/cost
  - Annual O&M savings/cost
- Financial Indicators
  - Simple (annual) payback
  - Cash flow
  - Internal Rate of Return

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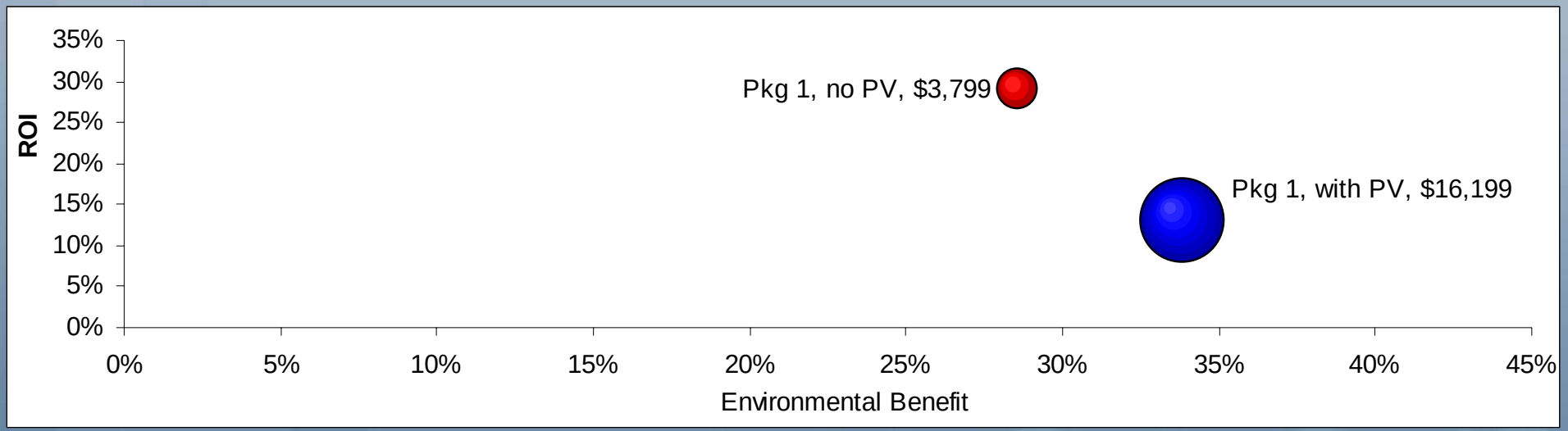
Environmental Benefit vs. Economics

- Factor in costs, utility savings & economics...
- “Biggest bang for the buck...”
- Help consumers understand real value of sustainability



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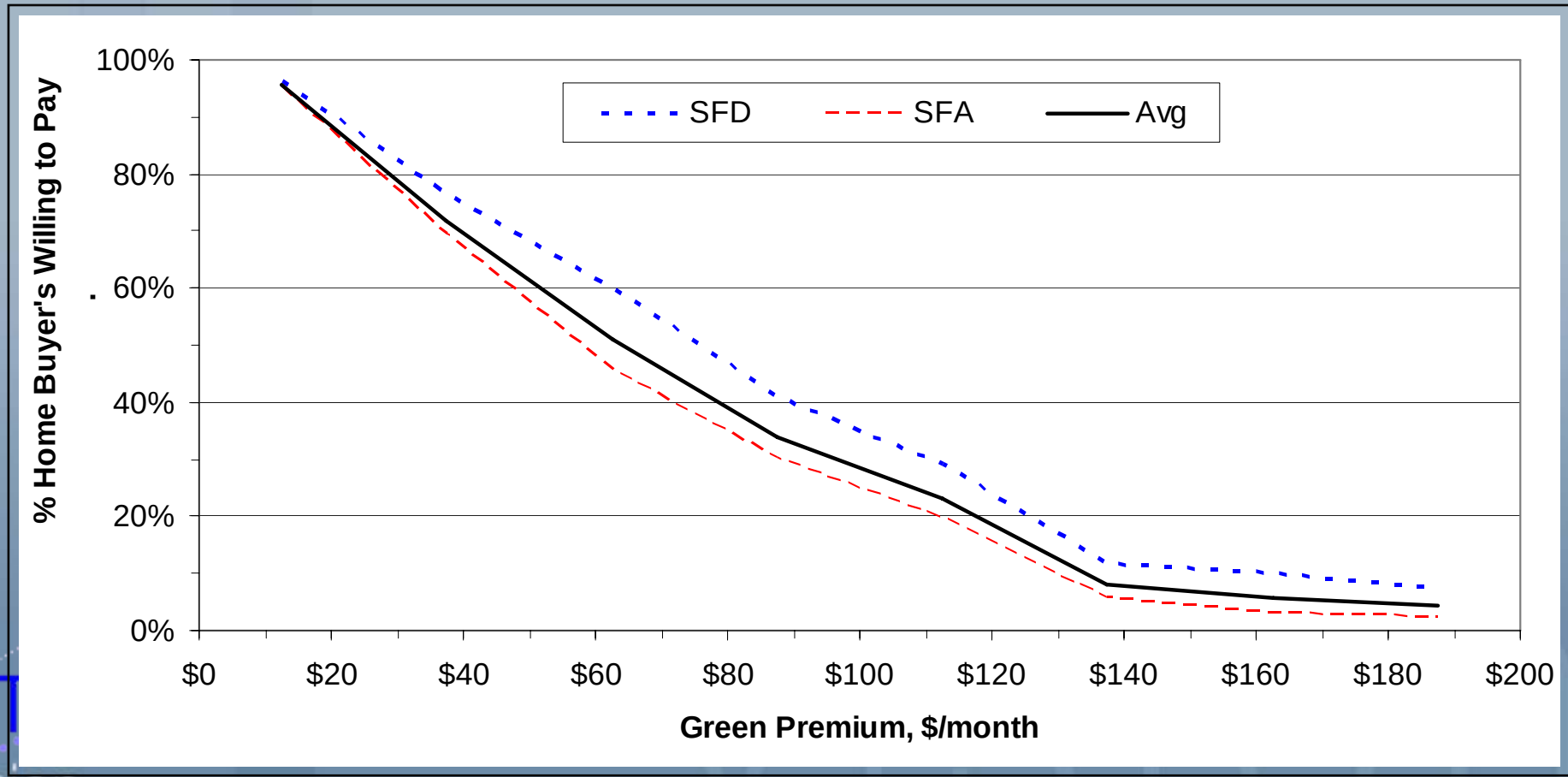
Consumers will pay for Green...

- If they understand the benefits, costs, and cost savings



*American LIVES Inc., Terramor Homebuyer Survey Highlights, 2005

Summary

- Need to fully integrate *Developers, Builders & Homeowners* into the *Sustainable Planning Process*
- Quantitative, Integrated Systems Analysis is an essential tool for:
  - Understanding & optimizing land-use, planning & design decisions at the developer/builder level
  - Educating consumers on the real value of the “green premium”
- Approach is applicable to corporate & education campuses, city/municipalities, etc.

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